# Abstracts

## New Approach to the Design and the Fabrication of THz Schottky Barrier Diodes

*A. Jelenski, A. Grub, V. Krozer and H.L. Hartnagel. "New Approach to the Design and the Fabrication of THz Schottky Barrier Diodes." 1993 Transactions on Microwave Theory and Techniques 41.4 (Apr. 1993 [T-MTT]): 549-557.*

GaAs Schottky barrier diodes with near-ideal electrical and noise characteristics for mixing applications in the THz frequency range are described. The conventional formulas describing these characteristics are valid only in a limited forward bias range, corresponding to currents much smaller than the operating currents under submillimeter mixing conditions. Therefore, generalized analytical expressions for the I-V and C-V characteristics of the metal-semiconductor junction in the full bias range are given. A new numerical diode model is presented which takes into account not only the phenomena occuring at the junction, such as current dependent recombination and drift/diffusion velocities, but also the variations of electron mobility and electron temperature in the undepleted epi-layer. A diode fabrication process based on the electrolytic pulse etching of GaAs in combination with an in situ platinum plating for the formation of the Schottky contacts is described. Schottky barrier diodes with a diameter of 1 µm fabricated by this process have already shown excellent results in a 650 GHz waveguide mixer at room temperature. A DSB conversion loss of 7.5 dB and a DSB mixer noise temperature of less than 2000K have been obtained at an intermediate frequency of 4 GHz. The noise and I-V characteristics of Schottky diodes with a smaller diameter of 0.8 µm are presented. The measured noise and I-V characteristics of these diodes show an excellent agreement with calculated values, confirming the validity of the proposed model.

❑ Return to main document.